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US 4136257
US 3968322
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(54) Wiring holder

(57) A wiring holder, particularly for an internal combustion fuel injection system, has an upper portion 7 and a lower portion 8 which engage through a plurality of pawls 17 (18 Fig. 2), to form a tubular, substantially cylindrical, enclosure about the fuel injector wires (W1 to W4). Apertures P1 to P4 formed in the upper portion of the wiring holder enable the wires to communicate with their respective fuel injection valves (V1 to V4). Drain holes 21 formed in the lower portion 8 enable water or the like to drain from the wiring holder. Fastening portions (22 Figs. 2 & 5), are formed integrally with the lower portion of the wiring holder to connect it to supporting protrusions (25,26) on the intake manifold (Mi).

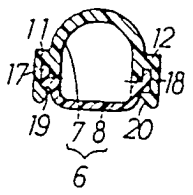

FIG. 3.

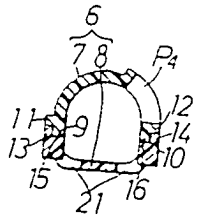

FIG. 4.

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SPECIFICATION

Wiring holder

This invention relates to wiring holders, particularly but not exclusively for internal combustion engine fuel injection systems.

In the context of the most common use of an internal combustion engine, i.e. automobile engines, it is necessary to protect electrical conduits and wires from the problems brought about by the surrounding environment. Any such protective device must be one which is easily accessible to facilitate assembly and repair of the wiring assembly. In addition it is necessary to have means to allow liquid, and particularly water, to drain out of any wiring holder since an accumlation of water or the like may result in short circuiting the wires or problems caused by freezing of the liquid. Finally, it is desirable to attach the holder to the internal combustion engine so as to maintain the path of electrical wires relative to the engine, in order to prevent breakage of the wires due to excessive forces which might otherwise be created due to engine vibration.

Viewed from one aspect the present invention provides a wiring holder comprising a tubular assembly of an upper portion and a lower portion engageable with each other along their length, a plurality of lateral apertures formed through said upper portion for the passage of wires, a plurality of drain holes formed through said lower portion, a plurality of engagement pawls with engagement hooks formed on said upper portion to engage said lower portion, and fastening portions integrally formed on said lower portion to attach said lower portion to a mounting surface.

Viewed from another aspect the invention provides, in or for an internal combustion engine fuel injection system having a plurality of fuel injectors and at least two supporting protrusions formed on the intake manifold, a wiring holder comprising a tubular assembly of an upper portion and a lower portion interengageable along their length, the upper portion being susbstantially semi-circular in transverse cross-section, the lower portion being substantially trough-shaped, the upper portion having a flange and a plurality of protrusions formed on at least one circumferential edge, the lower portion having a plurality of fitting recesses and a flange formed on at least one circumferential edge, means to connect said upper portion to said lower portion, means to connect said wiring holder to said supporting protrusions, and apertures in said wiring holder for wires therein to connect to said injectors.

Two embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:-

Figure 1 is a side elevation showing part of an internal combustion engine incorporating a wiring holder according to the invention;

Figure 2 is a top plan view of Figure 1;

Figure 3 is a cross-sectional view of the wiring holder, taken substantially along line III-III of Figure 2;

Figure 4 is a cross-sectional view taken substantially along line IV-IV of Figure 2;

Figure 5 is a cross-sectional view taken substantially along line V-V of Figure 2; and

Figure 6 is a cross-sectional view of a second embodiment of a wiring holder according to the invention.

Referring to Figures 1 and 2, an intake manifold Mi is connected at one end to the side portion of a multi-cylinder internal combustion engine body E by means of bolts, and has its intake passages communicating with the corresponding intake ports of the engine E cylinders. For purposes of example, the invention will be described in relation to a four-cylinder internal combustion engine; however it should not be construed from this example that the use of the invention is thereby limited.

Electromagnetic fuel injection valves V1 to V4 are fitted through seal members S into fuel injection portions 2 of the intake manifold Mi which correspond to each cylinder in the engine body E. The fuel injection valves V1 to V4 are equipped with wiring connectors C1 to C4 respectively, and are actuated by electrical pulses transmitted through the said wiring connectors. The electrical pulses are provided through wiring cords W1 to W4 which connect to the wiring connectors C1 to C4 respectively.

A fuel feeder 4 is fastened through an insulator 30 by means of bolts 31 to a supporting bed 29, and a holding member 3 holding electromagnetic fuel injection valves V1 to V4 is fastened to the fuel feeder 4. The supporting bed 29 is integrally formed with the intake manifold Mi, such that the respective electro-magnetic fuel injection valves V1 to V4 are clamped and supported between the fuel feeder 4 and their respective fuel injection portions 2. The fuel feeder 4 extends longitudinally of the row of cylinders of the engine body E and is formed with a fuel passage which extends in that direction. The fuel feeder 4 is also formed with mounting portions M1 to M4 at positions corresponding to the respective electromagnetic fuel injection valves V1 to V4, and the electromagnetic fuel injection valves V1 to V4 are so fitted in the mounting portions M1 to M4, respectively, as to provide a hermetic communication with the aforementioned fuel passage.

If the engine body E has pre-combustion chambers, branch tubes 5 communicate between the longitudinally central portion of the fuel feeder 4 and an electromagnetic fuel injection valve (not shown) for the pre-chambers.

A wiring holder 6 according to the invention encloses the wiring cords W1 to W4, which are connected to the wiring connectors C1 to C4 of the respective electromagnetic fuel injection valves V1 to V4. The wiring holder 6 is constructed so as to have a substantially cylindrical shape made up of an upper portion 7 and a lower portion 8 joined together. In a preferred embodiment, the upper and lower portions 7 and 8 are formed from a synthetic resin.

Referring now to Figures 3 to 5, the upper portion 7 of the wiring holder 6 has a generally semi-cylindrical shape. The circumferential ends of the upper portion 7 have protrusions 9 and 10 formed

thereon and flanges 11 and 12 which bulge radially outward.

The lower portion 8 of the wiring holder 6 is a trough with a generally U-shaped transverse section normal to its longitudinal direction. The circumferential ends of the lower portion 8 have flanges 13 and 14 formed thereon which interengage with the flanges 11 and 12 of the upper portion 7 when the wiring holder 6 is in the assembled condition. Fitting recesses 15 and 16 are also formed in the circumferential ends of the lower portion 8 to receive the protrusions 9 and 10 of the upper portion 7.

At three positions along the length of the upper portion 7, a pair of engagement pawls 17 and 18 (Figure 3) are formed to engage under the flanges 13 and 14 of the lower portion 8 when the upper and lower portions 7 and 8 are assembled. The engagement pawls 17 and 18 have engagement hooks 19 and 20 formed on their leading ends to engage the flanges 13 and 14. By engaging the pawls 17 and 18 of the upper portion 7 with the flanges 13 and 14 of the lower portion 8, as shown in Figure 3, the upper portion 7 and lower portion 8 are united to form a wiring holder 6 having a tubular generally cylindrical shape.

As exemplified in Figure 4, the upper portion 7 is formed with a plurality of wiring outlet apertures P1 to P4 at positions corresponding to the electromagnetic fuel injection valves V1 to V4. The apertures P1 to P4 face their respective electromagnetic fuel injection valves V1 to V4 so as to enable the wiring cords W1 to W4 to be connected to their respective wiring connectors C1 to C4. In addition, the upper portion 7 is provided with an aperture Ps, as shown in Figure 2, through which a wiring cord Ws may be connected to an aforementioned prechamber fuel injection valve.

The lower portion 8 of the wiring holder 6 is formed, as shown in Figure 4, with drain holes 21 at a plurality of positions spaced along its length, to allow water or the like to drain from the wiring holder 6. In addition, the lower portion 8 has fastening portions 22 and 23 formed with through holes 24 integrally formed at selected positions along its length to protrude laterally therefrom. The holding member 3 has supporting protrusions 25 and 26 formed integrally therewith at positions corresponding to the aformentioned fastening portions 22 and 23, to receive fastening bolts 27 and 28 fitted in the aforementioned through holes 24 to connect the wiring holder 6 to the holding member 3.

Referring now to Figure 6, a wiring holder 6' has an upper portion 7' and lower portion 8' which are hingedly connected to each other at one circumferential end through a thinned portion 32. The other circumferential ends of the upper portion 7' and lower portion 8' are interconnectible by means of engagement pawls 33 formed at spaced positions on the upper portion 7'.

In use, the wiring cords W1 to W4 and Ws are threaded through the upper portion 7 of the wiring holder 6 and are passed through their corresponding apertures P1 to P4 and Ps. The upper portion 7 and the lower portion 8 are then united by means of the engagement pawls 17 and 18 such that they enclose the wiring cords W1 to W4 and Ws therein.

In this condition, the fastening portion 22 and 23 are connected to the fastening protrusions 25 and 26 respectively, by means of the bolts 27 and 28. The wiring cords W1 to W4 and Ws extending through the apertures P1 to P4 and Ps are now connected to the wiring connectors C1 to C4 and the wiring connector of the pre-chamber fuel injection valve respectively, thus completing the wiring operation of the fuel injection system.

It will thus be seen that, at least in its preferred embodiments, the present invention provides a wiring holder which may be easily assembled and is accessible on an internal combustion engine, which has a plurality of wiring outlets and means to allow water or the like to drain from the holder, and which when used in a fuel injection system will prevent the electrical wires from being disconnected or damaged due to contact with other engine parts or engine vibrations.

CLAIMS

1. A wiring holder comprising a tubular assembly of an upper portion and a lower portion engageable with each other along their length, a plurality of lateral apertures formed through said upper portion for the passage of wires, a plurality of drain holes formed through said lower portion, a plurality of engagement pawls with engagement hooks formed on said upper portion to engage said lower portion, and fastening portions integrally formed on said lower portion to attach said lower portion to a mounting surface.

2. A wiring holder as claimed in claim 1, wherein one side of said lower portion is hingedly connected along its length to one side of said upper portion through a thinned member.

3. A wiring holder as claimed in claim 1, wherein the said upper portion is formed with longitudinally extending engagement protrusions and flanges at its edges and the said lower portion is formed with longitudinally extending fitting recesses and flanges to engage said upper portion protrusions and flanges when said upper and lower portions are in their assembled condition.

4. A wiring holder as claimed in any of claims 1 to 3, wherein said upper portion is substantially semi-cylindrical in transverse cross-section and said lower portion is a trough of substantially U-shaped transverse cross-section.

5. In or for an internal combustion engine fuel injection system having a plurality of fuel injectors and at least two supporting protrusions formed on the intake manifold, a wiring holder comprising a tubular assembly of an upper portion and a lower portion interengageable along their length, the upper portion being substantially semi-circular in transverse cross-section, the lower portion being substantially trough-shaped, the upper portion having a flange and a plurality of protrusions formed on at least one circumferential edge, the lower portion having a plurality of fitting recesses and a flange formed on at least one circumferential edge, means

to connect said upper portion to said lower portion, means to connect said wiring holder to said supporting protrusions, and apertures in said wiring holder for wires therein to connect to said injectors.

6. A wiring holder as claimed in claim 5, wherein said lower portion has drain holes formed therethrough.

7. A wiring holder as claimed in claim 5 or 6, wherein one circumferential edge of said upper portion is connected to one circumferential edge of said lower portion by a thinned member.

8. A wiring holder as claimed in any of claims 5 to 7, wherein said means to connect said upper portion to said lower portion includes pawls formed on said upper portion, said pawls having engagement hooks formed on the leading edge thereof to engage said lower portion flange.

9. Wiring holders substantially as hereinbefore described with reference to the accompanying drawings.

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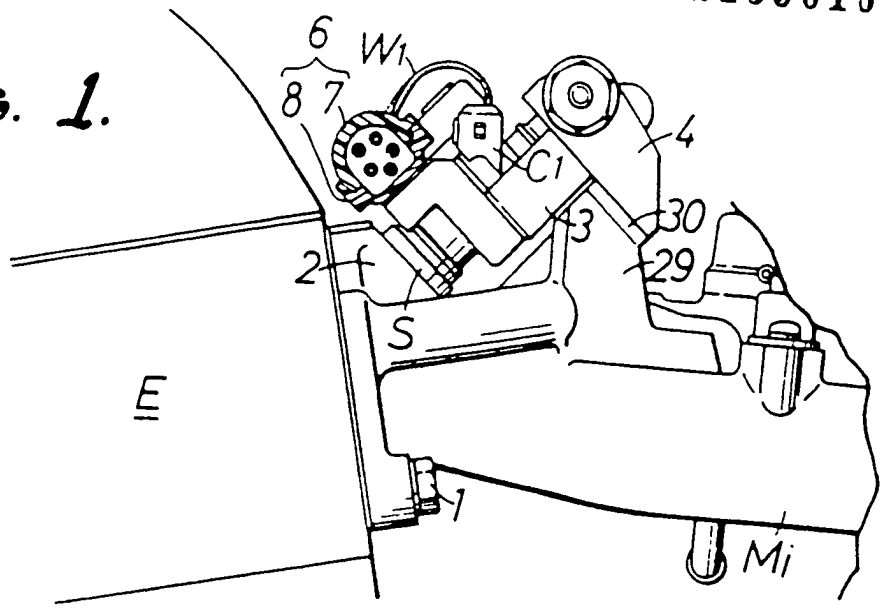
FIG. 1.



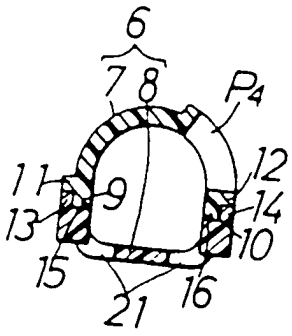


FIG. 4.

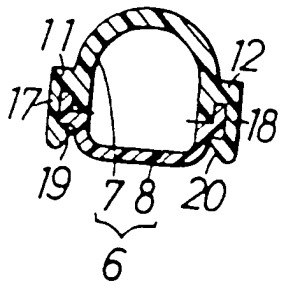
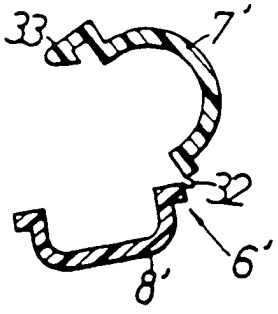


FIG. 3.



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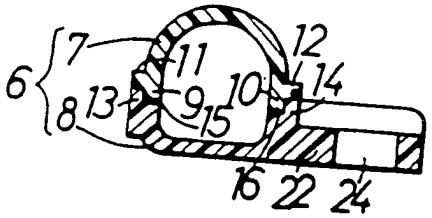

FIG. 5.

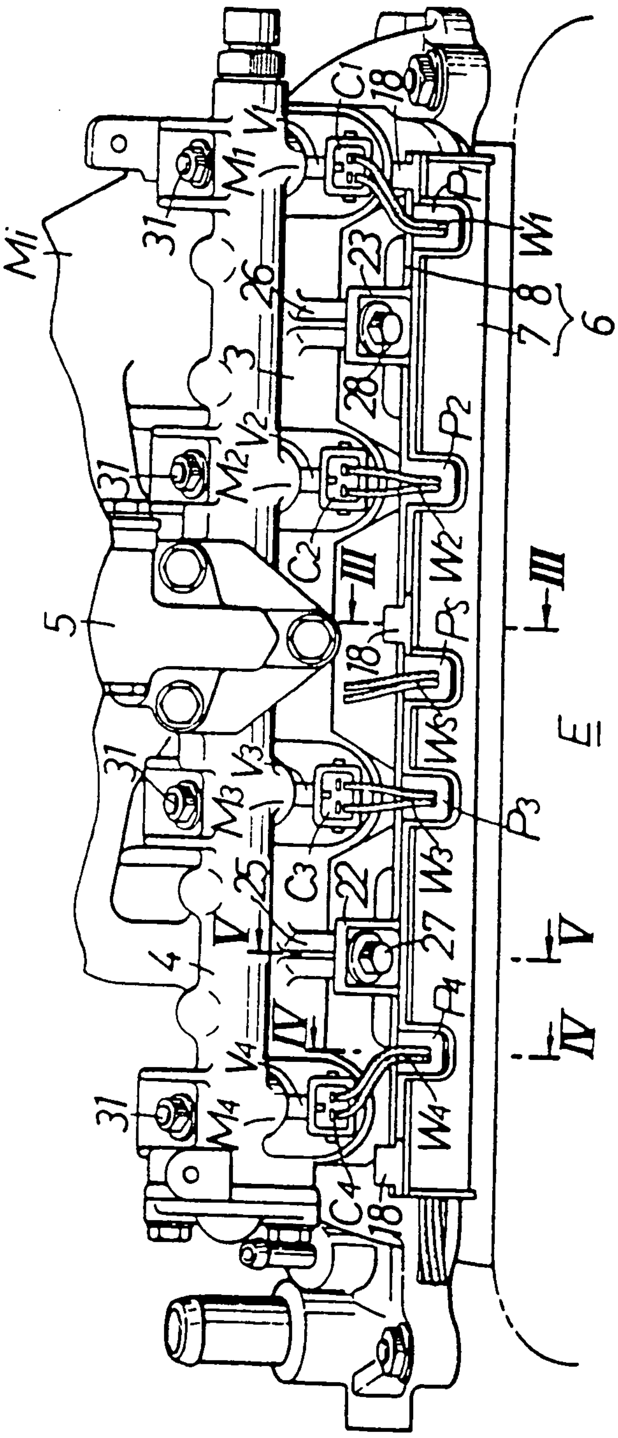
Mi
31
M1
V1
C1
18
P1
W1
23
26
3
7
8
6
28
P2
M2
V2
C2
W2
III
5
Ps
18
W5
E
M3
V3
C3
P3
W3
25
22
27
V
4
P4
IV
V4
M4
C4
W4
18

Fig. 2.